

CLAIMS

1. A diffractive security element (2) which is divided into surface portions (21; 22; 25) with an optically effective structure (9) of interfaces embedded between two layers of a layer composite (1) of plastic material, wherein at least the base layer (4) to be illuminated is transparent and the optically effective structure (9) has as a base structure a zero order diffraction grating with a period length (d) of at most 500 nm, characterised in that an integrated optical waveguide (5) comprising a transparent dielectric of a layer thickness (s) is embedded in at least one of the surface portions (21; 22; 25) between the base layer (4) and an adhesive layer (7) and/or a protective layer (6) of the layer composite (1), wherein the profile depth (t) of the optically effective structure (9) is in a predetermined relationship with the layer thickness (s).

2. A diffractive security element (2) as set forth in claim 1 characterised in that the profile depth (t) is equal to the layer thickness (s) within a tolerance of $\pm 5\%$.

3. A diffractive security element (2) as set forth in claim 1 or claim 2 characterised in that the layer thickness (s) is of values from the range of between 65 nm and 85 nm and the profile depth (t) is of values from the range of between 60 nm and 90 nm and that a value from the range of between 260 nm and 370 nm is selected for the period length (d).

4. A diffractive security element (2) as set forth in claim 1 characterised in that the profile depth (t) is equal to three times the layer thickness (s) within a tolerance of $\pm 5\%$.

5. A diffractive security element (2) as set forth in claim 4 characterised in that the layer thickness (s) is of a value of 60 nm, the profile depth (t) is of a value of 150 nm and the period length (d) is of a

value of 417 nm and that each of the values (d; s; t) involves a tolerance of 5%.

6. A diffractive security element (2) as set forth in claim 1 characterised in that the layer thickness (s) is equal to double the profile depth (t) within a tolerance of $\pm 5\%$.

7. A diffractive security element (2) as set forth in claim 6 characterised in that the layer thickness (s) is selected at 115 nm, the profile depth (t) at 65 nm and the period length (d) at 345 nm and that each of the values (d; s; t) involves a tolerance of 5%.

8. A diffractive security element (2) as set forth in one of claims 1 through 7 characterised in that the optically effective structure (9) is a superimposition of the zero order diffraction grating with a relief structure (17), and that the relief structure (17) has a spatial frequency (F) of smaller than 220 lines/mm and a value of the blaze angle (γ) from the range of between 1° and 15° .

9. A diffractive security element (2) as set forth in claim 8 characterised in that a diffraction grating vector (19) of the zero order diffraction grating and a relief vector (20) of the relief structure (17) include an azimuth difference angle (ψ) which is of one of the values 0° , 45° , 90° and so forth.

10. A diffractive security element (2) as set forth in one of claims 1 through 9 characterised in that the dielectric has a refractive index (n_2) of 2.3.

11. A diffractive security element (2) as set forth in one of claims 1 through 10 characterised in that arranged in the surface portions (21; 22; 25) are field portions (26) with grating structures having spatial

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frequencies in the range of between 300 lines/mm and 1800 lines/mm and azimuth angles in the range of between 0° and 360°.